

The PREFACE.

sick gravity is of no efficacy. By this I have also found, that look what proportion the Sine of the Angle of one Inclination has to the Sine of the Angle of Refraction, correspondent to it, the same proportion have all the Sines of other Inclinations to the Sines of their appropriate Refractions.

My way for measuring how much a Glas magnifies an Object, plac'd at a convenient distance from my eye, is this. Having rectifi'd the *Microscope*, to see the desir'd Object through it very distinctly, at the same time that I look upon the Object through the Glas with one eye, I look upon other Objects at the same distance with my other bare eye; by which means I am able, by the help of a *Ruler* divided into inches and small parts, and laid on the *Pedestal* of the *Microscope*, to cast, as it were, the magnifi'd appearance of the Object upon the *Ruler*, and thereby exactly to measure the Diameter it appears of through the Glas, which being compar'd with the Diameter it appears of to the naked eye, will easily afford the quantity of its magnifying.

The *Microscope*, which for the most part I made use of, was shap'd much like that in the sixth Figure of the first *scheme*, the Tube being for the most part not above six or seven inches long, though, by reason it had four Drawers, it could very much be lengthened, as occasion required; this was contriv'd with three Glasses; a small Object Glas at A, a thinner Eye Glas about B, and a very deep one about C: this I made use of only when I had occasion to see much of an Object at once; the middle Glas conveying a very great company of radiating Pencils, which would go another way, and throwing them upon the deep Eye Glas. But when ever I had occasion to examine the small parts of a Body more accurately, I took out the middle Glas, and only made use of one Eye Glas with the Object Glas, for always the fewer the Refractions are, the more bright and clear the Object appears. And therefore 'tis not to be doubted, but could we make a *Microscope* to have one only refraction, it would, *ceteris paribus*, far excel any other that had a greater number. And hence it is, that if you take a very clear piece of a broken *Venice* Glas, and in a Lamp draw it out into very small hairs or threads, then holding the ends of these threads in the flame, till they melt and run into a small round Globul, or drop, which will hang at the end of the thread; and if further you stick several of these upon the end of a stick with a little sealing Wax, so as that the threads stand upwards, and then on a Whetstone first grind off a good part of them, and afterward on a smooth Metal plate, with a little Tripoly, rub them till they come to be very smooth; if one of these be fixt with a little soft Wax against a small needle hole, prick'd through a thin Plate of Brass, Lead, Pewter, or any other Metal, and an Object, plac'd very near, be look'd at through it, it will both magnifie and make some Objects more distinct than any of the great *Microscopes*. But because these, though exceeding easily made, are yet very troublesome to be us'd, because of their smalness, and the nearness of the Object; therefore to prevent both these, and yet have only two Refractions, I provided me a Tube of Brass, shap'd much like that in the fourth Figure of the first *scheme*; into the smaller end of this I fixt with Wax a good plano con-

The PREFACE.

vex Object Glas, with the convex side towards the Object, and into the bigger end I fixt also with wax a pretty large plano Convex Glas, with the convex side towards my eye, then by means of the small hole by the side, I fill'd the intermediate space between these two Glasses with very clear Water, and with a Screw stopp'd it in; then putting on a Cell for the Eye, I could perceive an Object more bright then I could when the intermediate space was only fill'd with Air, but this, for other inconveniences, I made but little use of.

My way for fixing both the Glas and Object to the *Pedestal* most conveniently was thus: Upon one side of a round *Pedestal* A B, in the sixth Figure of the first *scheme*, was fixt a small Pillar C C, on this was fitted a small Iron Arm D, which could be mov'd up and down, and fixt in any part of the Pillar, by means of a small Screw E; on the end of this Arm was a small Ball fitted into a kind of socket F, made in the side of the Brass Ring G, through which the small end of the Tube was screw'd; by means of which contrivance I could place and fix the Tube in what posture I desir'd (which for many Observations was exceeding necessary) and adjusten it most exactly to any Object.

For placing the Object, I made this contrivance; upon the end of a small brass Link or Staple H H, I so fastned a round Plate I I, that it might be turn'd round upon its Center K, and going pretty stiff, would stand fixt in any posture it was set; on the side of this was fixt a small Pillar P, about three quarters of an inch high, and through the top of this was thrust a small Iron pin M, whose top just stood over the Center of the Plate; on this top I fixt a small Object, and by means of these contrivances I was able to turn it into all kind of positions, both to my Eye and the Light; for by moving round the small Plate on its center, I could move it one way, and by turning the Pin M, I could move it another way, and this without stirring the Glas at all, or at least but very little: the Plate likewise I could move to and fro to any part of the *Pedestal* (which in many cases was very convenient) and fix it also in any Position, by means of a Nut N, which was screw'd on upon the lower part of the Pillar C C. All the other Contrivances are obvious enough from the draught, and will need no description.

Now though this were the Instrument I made most use of, yet I have made several other Tryals with other kinds of *Microscopes*, which both for matter and form were very different from common spherical Glasses. I have made a *Microscope* with one piece of Glas, both whose surfaces were plains. I have made another only with a plano concave, without any kind of reflection, divers also by means of reflection. I have made others of Waters, Gums, Refins, Salts, Arsenick, Oyls, and with divers other mixtures of watery and oily Liquors. And indeed the subject is capable of a great variety; but I find generally none more useful then that which is made with two Glasses, such as I have already describ'd.

What